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variability of the proper motion; but if we divide the interval between the first and the last Greenwich observations into three short intervals, a very marked agreement is shown in the three results for proper motion in R.A., as determined from the two independent series of observations. The change during this period in the proper motion in N.P.D., as given in the Edinburgh results, is very slight, and is far too small for us to expect more in this element than a general agreement. The following are the proper motions in R.A. and N.P.D., deduced directly from the numbers in the corresponding tables in Professor Smyth's paper and in this Note:—

| Interval. | Proper Motion in R.A. Edinburgh. | Proper Motion in R.A. Greenwich. | Proper Motion in N.P.D. Edinburgh. | Proper Motion in N.P.D. Greenwich. |
|---|---|---|---|---|
| | s | s | ″ | ″ |
| 1837 to 1838 | +0·152 | +0·142 | ... | ... |
| 1838 to 1852 | +0·144 | +0·130 | ... | ... |
| 1845 to 1846 | ... | ... | −1·36 | −2·25 |
| 1846 to 1852 | ... | ... | −1·37 | −1·11 |
| 1852 to 1858 | +0·108 | +0·106 | −1·32 | −1·65 |

The above numbers sufficiently show the importance of continuing the observations of this star; it is therefore again inserted in the Greenwich working-catalogue, and probably a series of observations of it will be made before the close of the year. That its proper motion in both elements is a remarkable one, an inspection of Professor Smyth's table is sufficient proof; and it is for this reason that I have thought it interesting to insert in the same number of the *Monthly Notices* the results from the Greenwich observations of this star as a supplement to Professor Smyth's paper.

*Kenwyn, Kidbrooke,*
*Blackheath,* 1875, *May* 10.

## *On the Period of the Double Star η Coronæ Borealis.*

By J. M. Wilson, Esq.

The period of this star seems to be not yet quite satisfactorily ascertained in spite of the very great care with which its orbit has been studied. Herschel in 1833 first calculated the orbit, and made its period 44·242 years. Mädler computed three orbits. In 1838 he made the period 43·310; in 1842, 43·246; in 1847, 42·500 years, respectively. Villarceau produced two orbits on different hypotheses as to an early observation of Sir W. Herschel, one giving a period of 42·501 years, the other, which he preferred, but which events have declared against, of 67·309 years.

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Winnecke, using observations up to the spring of 1856, made a very careful examination of the orbit in his *De Stellâ η Coronæ Borealis Duplici Dissertatio Astronomica Inauguralis.* At this time there appeared to be ample materials for calculating an orbit, for the star had been well watched through 300° of its orbit, independently of two early isolated measures of Sir W. Herschel, in 1781·69, and 1802·69, which might be valuable as affording confirmation of the period. After the most complete discussion, he decides on an orbit with a period of 43·115 years, "cujus comparatio cum observationibus nobis demonstravit reddere id observationes usque ad quantitates quas in mensuris ipsis præstare non possumus." He says also elsewhere, that these elements "reddunt observationes ipsissimas;" and his comparison of the calculated and observed places justifies this remark.

And yet his orbit appears now to be considerably in error. For recent observations, as far as I have been able to procure them, are as follow:—

TABLE I.

| $t$ | $\theta$ | Observer. | No. of nights. |
|---|---|---|---|
| 1863·03 | 19°·04 | Dembowski | 24 |
| 64·43 | 24·16 | „ | 10 |
| 65·44 | 27·52 | Dawes | 3 |
| ·49 | 27·40 | Dembowski | 9 |
| 66·44 | 30·06 | „ | 9 |
| 67·50 | 33·19 | „ | 7 |
| 68·39 | 36·47 | „ | 7 |
| 70·38 | 44·01 | „ | 8 |
| ·4 | 44·6 | Gledhill | 1 |
| ·45 | 44·15 | Talmage | |
| 71·41 | 47·70 | „ | |
| ·45 | 47·72 | Dembowski | 8 |
| ·5 | 46·47 | Gledhill | 2 |
| ·56 | 47·60 | Seabroke | 2 |
| 72·29 | 47·83 | Talmage | |
| ·49 | 51· | Wilson and Seabroke | 1 |
| 73·41 | 55·90 | „ | 5 |
| ·55 | 55·45 | Gledhill | 2 |
| 74·34 | 58·43 | „ | 2 |
| ·47 | 58·25 | Wilson and Seabroke | 2 |
| 75·31 | 68·10 | Seabroke and Smith | 3 |

By means of these I have constructed a table of interpolated positions for the beginning of each year; which is compared in

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the following table with the positions obtained from Winnecke's orbit, showing a systematic and increasing divergence, which is far too large to be accidental.

TABLE 2.

| *t* | *θ* Obs. | *θ′* Calc. | *θ′ − θ* |
|---|---|---|---|
| 1863 | 18°·9 | 16°·8 | − 2·1 |
| 64 | 22·3 | 19·8 | − 2·5 |
| 65 | 25·6 | 22·6 | − 3·0 |
| 66 | 28·8 | 25·3 | − 3·5 |
| 67 | 31·9 | 27·9 | − 4·0 |
| 68 | 35· | 30·5 | − 4·5 |
| 69 | 38·3 | 33·2 | − 5·1 |
| 70 | 41·9 | 35·9 | − 6·0 |
| 71 | 45·7 | 38·8 | − 6·9 |
| 72 | 49·8 | 41·9 | − 7·9 |
| 73 | 54·2 | 45·3 | − 8·9 |
| 74 | 58·9 | 49·0 | − 9·9 |
| 75 | 64·2 | 53·2 | − 11· |

It may be remarked that the star is at its maximum distance in the year 1866 or 1867, a distance slightly greater than 1″·1, and in the years 1873 and 1874 the distance is very nearly 1″, and that therefore a systematic error of observation of the amount stated is impossible.

In order to ascertain the period, we may compare the observations during its last revolution when it was in the same part of its orbit that it now occupies. They are, corrected for precession to the year 1880, as follow:—

TABLE 3.

| *t* | *θ* | Observer | No. of nights |
|---|---|---|---|
| 1831·34 | 50°·23 | Dawes | 2 |
| ·42 | 52·27 | Herschel | 10 |
| ·63 | 50·60 | Struve | 3 |
| 32·48 | 56·48 | Herschel | 10 |
| ·55 | 56·48 | Dawes | 1 |
| ·76 | 56·65 | Struve | 3 |
| 33·28 | 61·88 | Herschel | 8 |
| ·39 | 63·32 | Dawes | 3 |
| 35·41 | 74·07 | Struve | 6 |
| 36·52 | 88·49 | Struve | 6 |
| 37·47 | 95·06 | Struve | 4 |
| 38·44 | 106·80 | Struve | 5 |

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These observations, which are not very accordant, give as interpolated values (subject to some error), in a more convenient form for comparison of dates, and calculation of the period, the following table:—

TABLE 4.

| θ | t | t′ |
|---|---|---|
| 50° | 1830·91 | 72·1 |
| 55 | 32·00 | 73·2 |
| 60 | 33·03 | 74·2 |
| 65 | 33·80 | 75·0 |
| 70 | 34·49 | |
| 75 | 35·13 | |
| 80 | 35·75 | |
| 85 | 36·33 | |
| 90 | 36·87 | |
| 95 | 37·37 | |
| 100 | 37·84 | |
| 105 | 38·27 | |
| 110 | 38·66 | |

So far as these suffice to give a sidereal period they give one of 41·2 years.

It will be interesting to examine how far this period satisfies the early observations of Sir W. Herschel. The comparison is as follows:—

| t | θ obs. | θ′ calc. | θ′−θ |
|---|---|---|---|
| 1781·69 | 30°·35 | 22°·9 | −7°·4 |
| 1802·69 | 180·11 | 180·0 | −0·1 |

By Winnecke's period the corresponding errors are − 0°·04 and + 6°·89 respectively, which are nearly as large.

The hypothesis that would best satisfy the observations is, that there exists in each successive revolution some shortening of the period, accompanied perhaps with a progression of the line of apsides. But it is too soon to attempt to submit this to a strict examination. It is at any rate demonstrated that the period of the star is shorter than any that has been hitherto assigned to it, and that it does not differ widely from 41·2 years. A reference to Table 4 during the next five years will perhaps elicit some remarkable results.

*Temple Observatory, Rugby,*
1875, *April.*